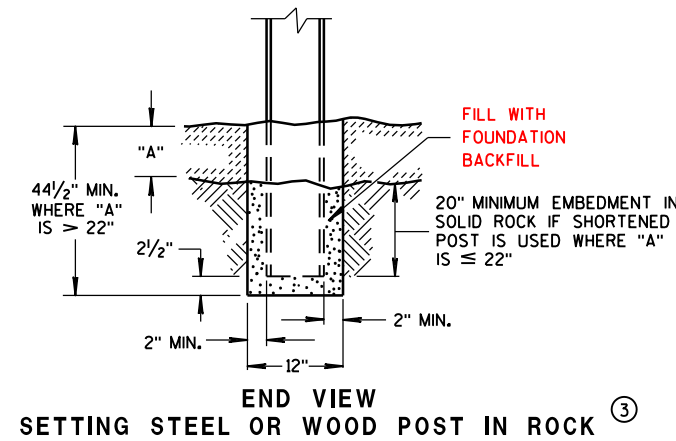


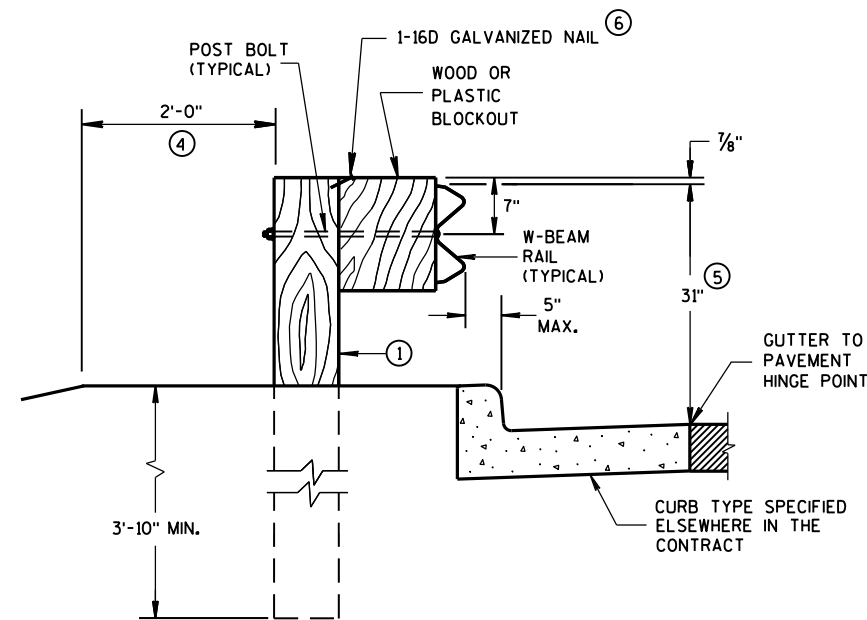


## GENERAL NOTES

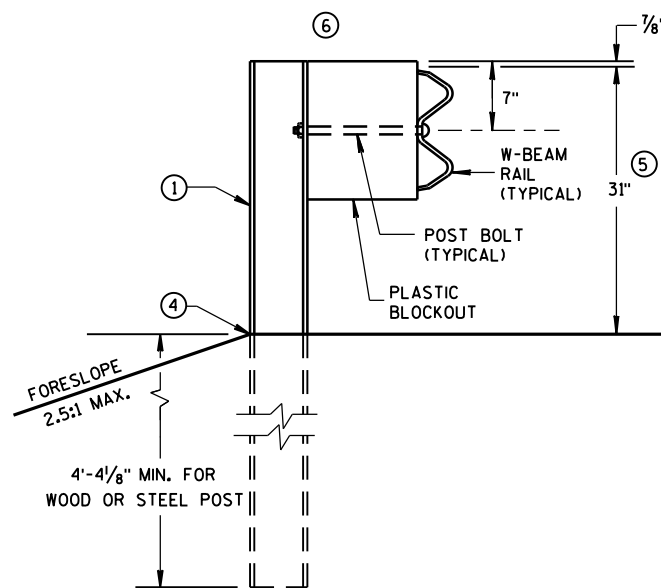
- WOOD OR STEEL POSTS (w6X9 OR w6X8.5) MAY BE USED. DO NOT INTERMIX WOOD AND STEEL POSTS. INSTALL STEEL POSTS WITH HOLES ON APPROACHING TRAFFIC SIDE.
- USE WOOD OR APPROVED PLASTIC BLOCKOUTS. WOOD BLOCKOUTS MAY BE CONSTRUCTED OUT OF TWO OR MORE WOOD BLOCKOUTS. SEE ALTERNATE WOOD BLOCKOUT DETAIL. DIMENSIONS OF APPROVED PLASTIC BLOCKOUTS MAY VARY.
- IF ROCK IS ENCOUNTERED DURING EXCAVATION, PROVIDE A HOLE 12 INCHES IN DIAMETER EXTENDING 20 INCHES DEEP INTO THE ROCK. PLACE APPROXIMATELY 2 1/2 INCHES OF GRANULAR MATERIAL IN THE BOTTOM OF THE HOLE. CUT THE POSTS THE TO LENGTH AND INSTALL. BACKFILL WITH EXCAVATED MATERIAL AND COMPACT. BACKFILL IS TO BE FREE OF LARGE ROCKS.
- WHEN THE DISTANCE FROM BACK OF POST TO SHOULDER HINGE POINT IS LESS THAN 2 FEET INSTALL LONGER POST AT HALF POST SPACING (K).
- FOR NEW MGS INSTALLATION TOP OF W-BEAM RAIL TOLERANCE IS  $\pm 1"$ . FOR EXISTING MGS INSTALLATION TOP OF W-BEAM IS BETWEEN 27 3/4" TO 32".
- WHEN USING STEEL POST AND WOOD BLOCKOUTS INSTALL FOUR 16D GALVANIZED NAILS. INSTALL NAILS AT THE BACK CORNERS OF THE BLOCK AND BEND THE NAILS OVER THE FLANGE OF THE STEEL POST.



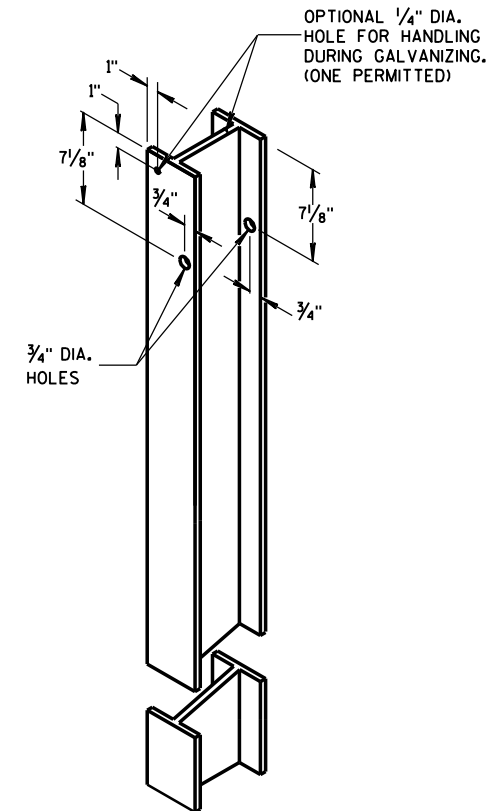
END VIEW  
SETTING STEEL OR WOOD POST IN ROCK ③



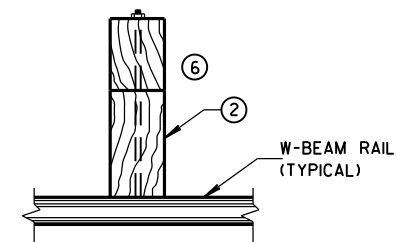
END VIEW  
LOCATED ALONG A CURBED ROADWAY



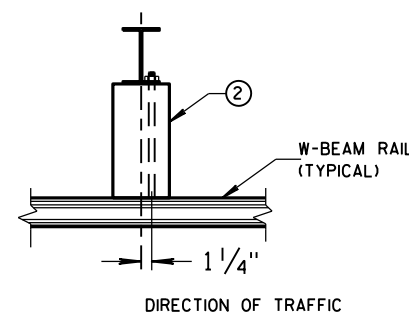
END VIEW  
MGS LONGER POST AT HALFPST SPACING W BEAM (K)



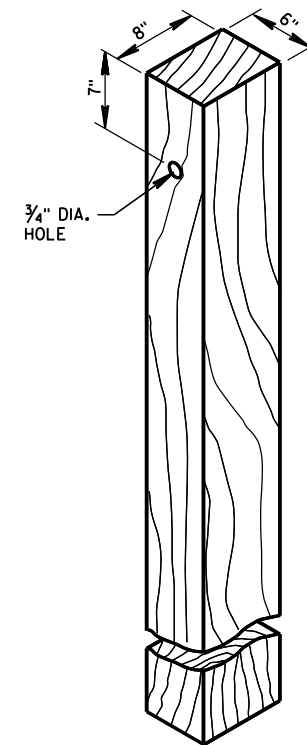
STEEL POST &  
HOLE PUNCHING DETAIL  
(w6X9) ①



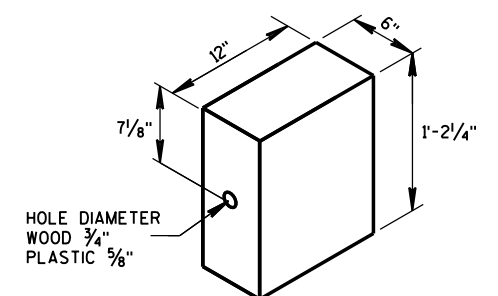
PLAN VIEW  
WOOD POST,  
BLOCKOUT & BEAM



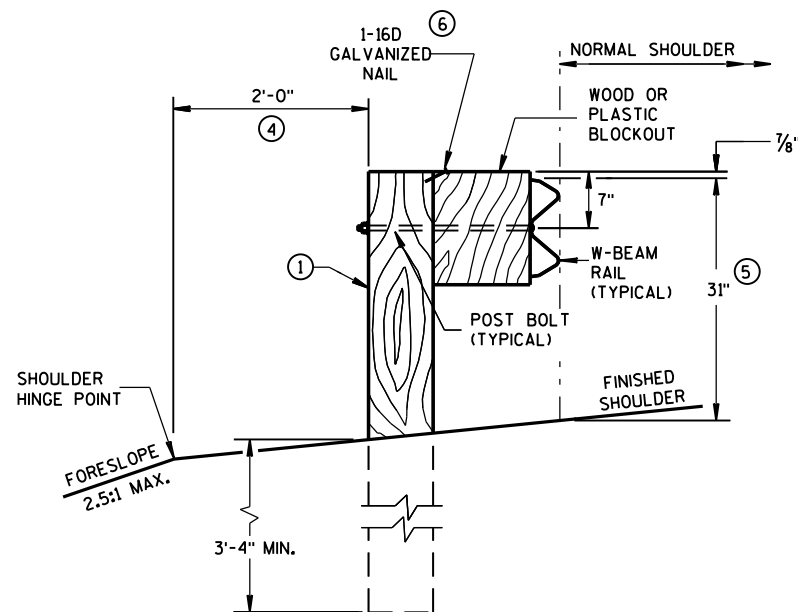
PLAN VIEW  
STEEL POST,  
PLASTIC BLOCKOUT & BEAM



WOOD POST  
(6" X 8") NOMINAL ①



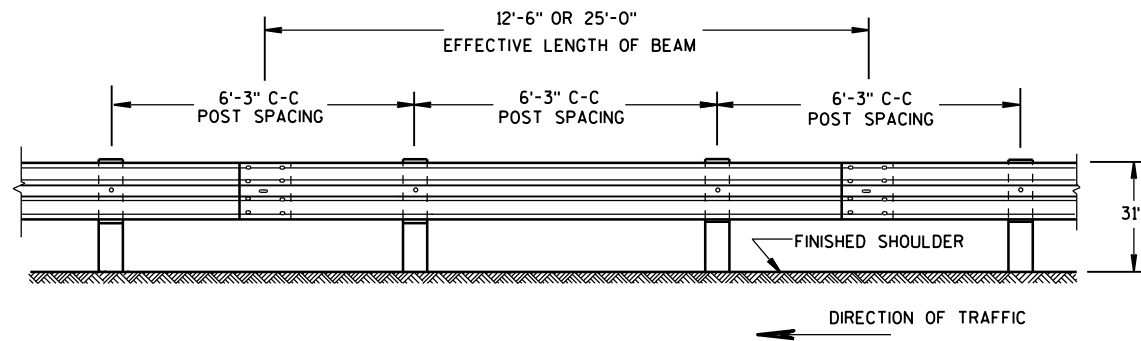
WOOD OR  
PLASTIC BLOCKOUT ②



END VIEW  
LOCATED ALONG A ROADWAY SHOULDER  
STANDARD INSTALLATION

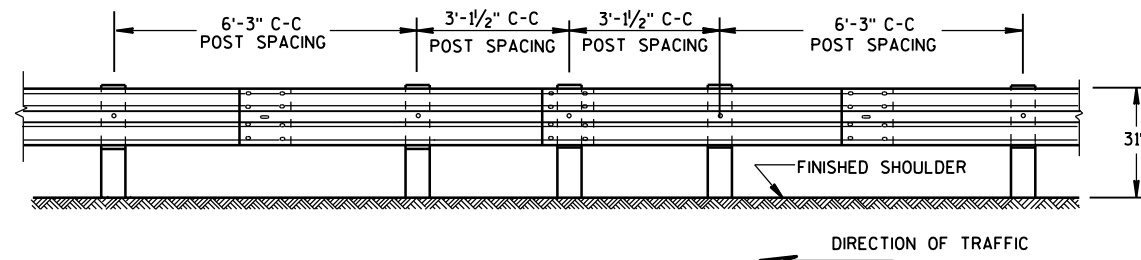
MIDWEST GUARDRAIL SYSTEM  
(MGS) GUARDRAIL

STATE OF WISCONSIN  
DEPARTMENT OF TRANSPORTATION



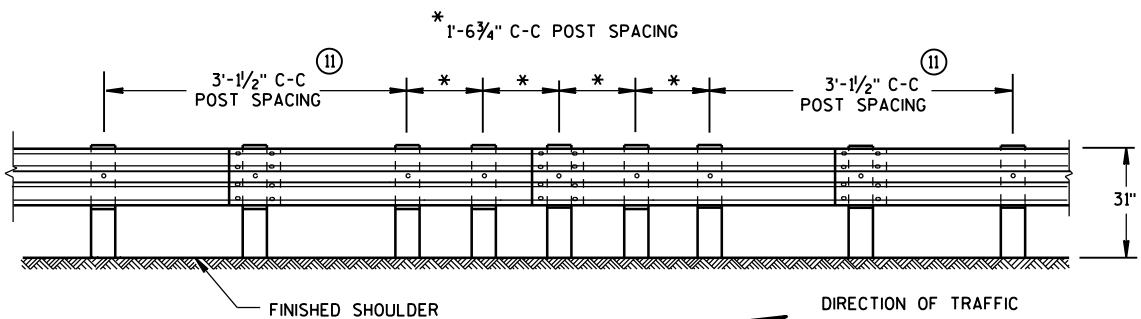
FRONT VIEW

POST SPACING STANDARD INSTALLATION



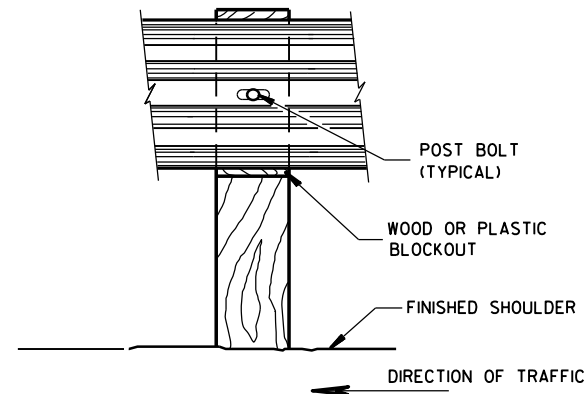
FRONT VIEW

HALF POST SPACING (HS) AND  
HALF POST SPACING WITH LONGER POSTS (K)

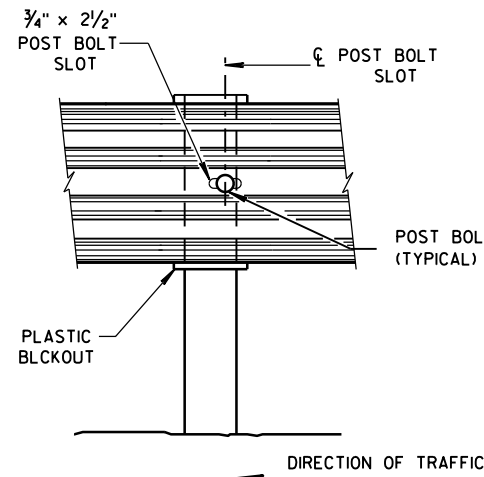


FRONT VIEW

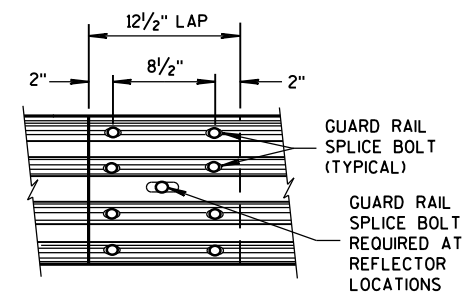
QUARTER POST SPACING (QS)



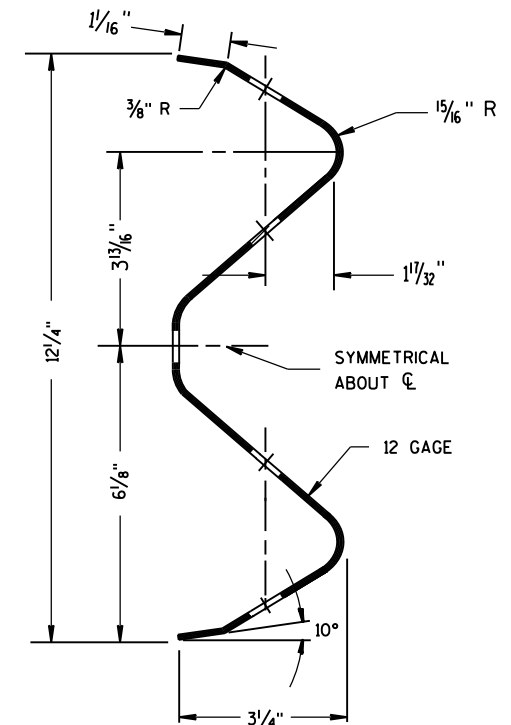
FRONT VIEW AT WOOD POST



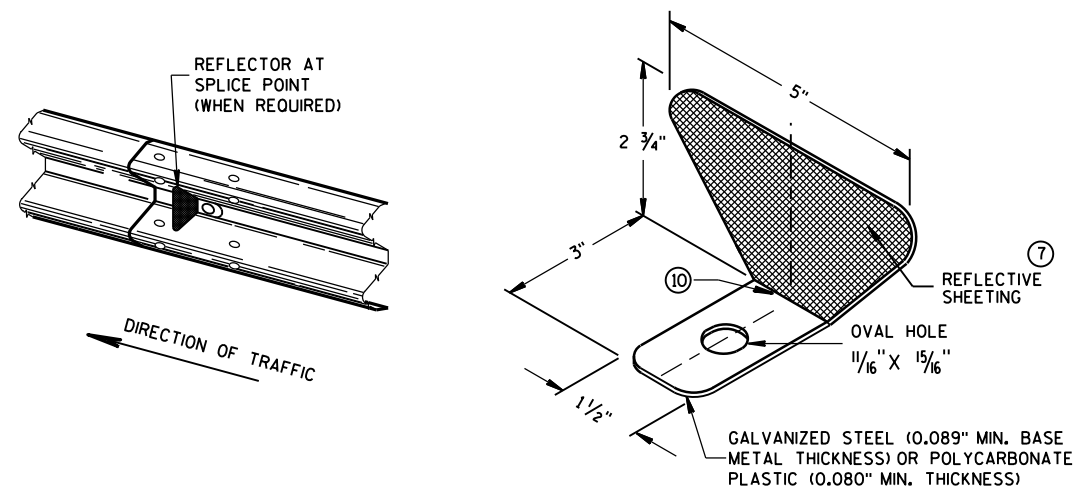
FRONT VIEW AT STEEL POST



FRONT VIEW  
MID-SPAN BEAM SPLICE



SECTION THRU W-BEAM RAIL



ONE SIDED REFLECTOR DETAIL AND TYPICAL INSTALLATION

GENERAL NOTES

- PROVIDE SILVER REFLECTIVE SHEETING ON ALL REFLECTORS EXCEPT THOSE LOCATED ALONG THE LEFT EDGE OF ONE-WAY ROADWAYS, WHICH SHALL BE PROVIDED WITH YELLOW REFLECTIVE SHEETING. SHEETING IS TYPE H. SEE STANDARD SPECIFICATION 637.
- DO NOT INSTALL REFLECTORS ON THE FIRST 50 FEET OF THE APPROACH END OF THE ENERGY ABSORBING TERMINAL. RAIL SPLICE LOCATIONS ARE THE ONLY ACCEPTABLE LOCATIONS FOR REFLECTORS.
- REVERSE EVERY OTHER REFLECTOR FOR 2-WAY VISIBILITY. THE CONTRACTOR MAY FURNISH TWO-SIDED REFLECTORS IN LIEU OF ONE-SIDED REFLECTORS.
- PROVIDE AN ANGLE OF BEND OF  $90^\circ \pm 1^\circ$  FOR TWO-SIDED REFLECTORS.
- 25 FEET OF HALF POST SPACING IS REQUIRED ON APPROACH AND DEPARTURE ENDS OF QUARTER POST SPACING.

POST BOLTS ARE A  $\frac{5}{8}$ " DIAMETER ASTM A307 GUARDRAIL BOLT. A POST BOLT REQUIRES  $\frac{5}{8}$ " DIAMETER A563A DOUBLE RECESSED (DR) HEAVY HEX NUT AND  $\frac{5}{8}$ " DIAMETER F844 FLAT WASHER. POST BOLTS MAY BE LONGER IF MULTIPLE BLOCKOUTS ARE BEING USED.

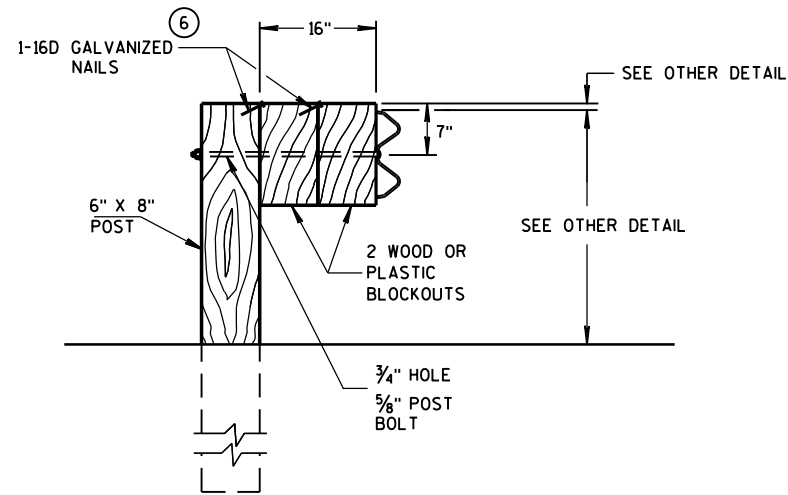
GUARD RAIL SPLICE BOLTS ARE A  $\frac{5}{8}$ " DIAMETER ASTM A307 GUARDRAIL HEAD BOLT. A GUARDRAIL SPLICE BOLT REQUIRES  $\frac{5}{8}$ " DIAMETER A563A DOUBLE RECESSED (DR) HEAVY HEX NUT.

REFLECTOR SPACING

	BEAM GUARD LENGTH	REFLECTOR SPACING	NO. SURFACES REFLECTORIZED	MIN. NO. REFLECTORS
ONE WAY TRAFFIC	< 200'	50' C-C	1	3
	> 200'	100' C-C	1	
TWO WAY TRAFFIC	< 200'	25' C-C	1	6
	> 200'	50' C-C	1	
TWO WAY TRAFFIC	< 200'	50' C-C	2	3
	> 200'	100' C-C	2	

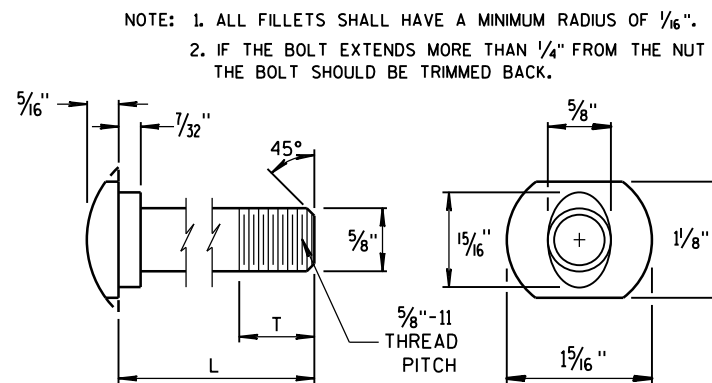
MIDWEST GUARDRAIL SYSTEM  
(MGS) GUARDRAIL

STATE OF WISCONSIN  
DEPARTMENT OF TRANSPORTATION



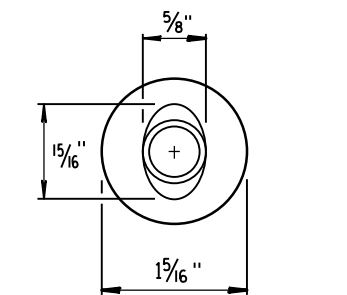
## DETAIL FOR 16" BLOCKOUT DEPTH

IT IS ACCEPTABLE TO USE BLOCKOUTS UP TO 16" DEEP TO INCREASE THE POST OFFSET TO AVOID UNDERGROUND OBSTACLES. THERE IS NO LIMIT TO THE NUMBER OF POSTS THAT CAN HAVE ADDITIONAL BLOCKOUTS UP TO 16" DEEP.

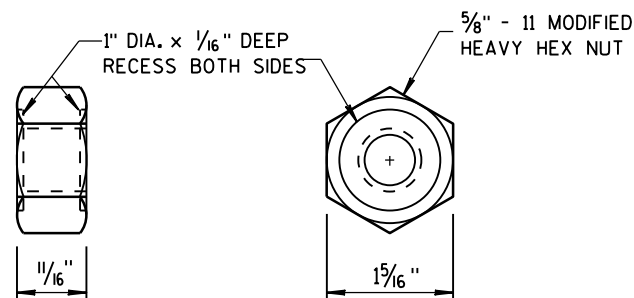


POST BOLT TABLE

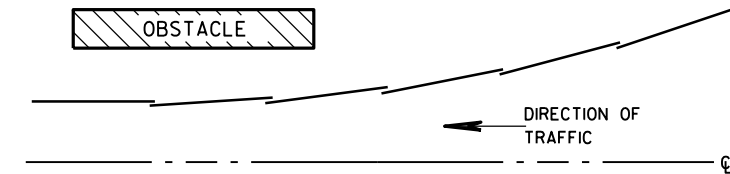
L	T (MIN.)
1 1/4"	1 1/8"
2"	1 3/4"
10"	4"
14"	4 1/16"
18"	4"
21"	4 1/16"
25"	4"



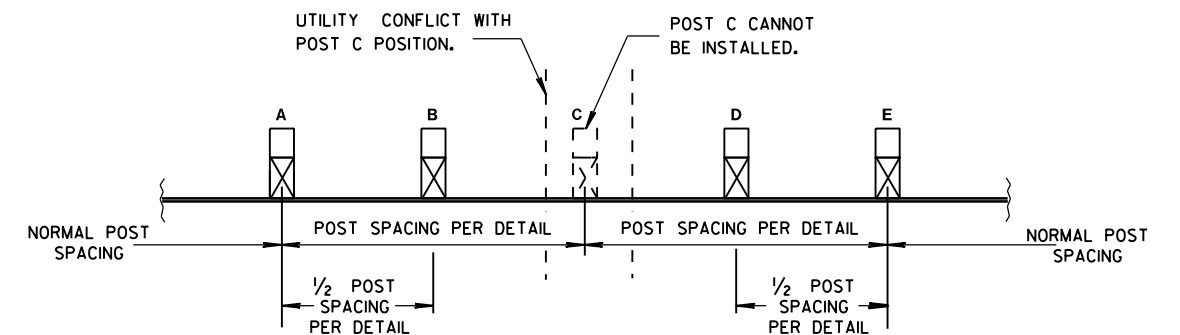
ALTERNATE BOLT HEAD



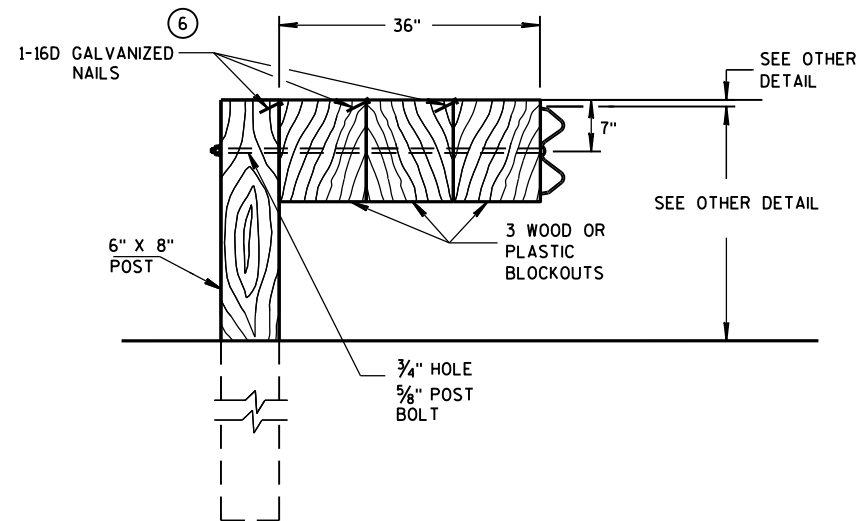
POST BOLT, SPLICE BOLT AND RECESS NUT



PLAN VIEW  
BEAM LAPPING DETAIL



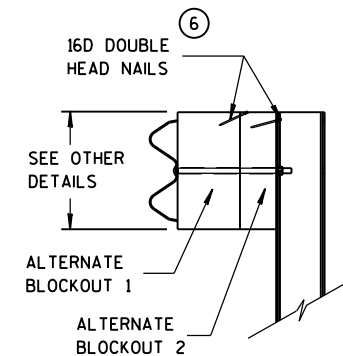
POST DRIVING FOR CONTINUOUS  
UNDERGROUND OBSTRUCTION



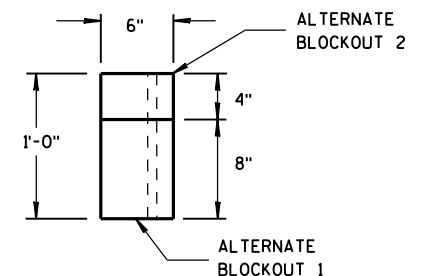
## DETAIL FOR 36" BLOCKOUT DEPTH

NOTES: UNDER SPECIAL CIRCUMSTANCES, SUCH AS AVOIDING OBSTACLES THAT ARE NOT RELOCATED, IT IS ACCEPTABLE TO INSTALL ADDITIONAL BLOCKOUTS TO OBTAIN UP TO 36" DEPTH FOR ONE OR TWO POSTS IN A SECTION OF GUARDRAIL.

DO NOT USE 16" OR 36" BLOCKOUTS IF IT CAUSES THE POST TO BE DRIVEN BEYOND SHOULDER HINGE POINT OR CAUSES A FIXED OBJECT TO BE WITHIN THE DEFLECTION DISTANCE OF THE BARRIER.



SIDE VIEW



TOP VIEW

ALTERNATE WOOD  
BLOCKOUT DETAIL

MIDWEST GUARDRAIL SYSTEM  
(MGS) GUARDRAIL

STATE OF WISCONSIN  
DEPARTMENT OF TRANSPORTATION

APPROVED  
June 2016  
DATE  
FHWA

/S/ Jerry H. Zogg  
ROADWAY STANDARDS DEVELOPMENT  
ENGINEER

*Midwest Guardrail System (MGS) Guardrail***References:**[Standard Spec 614](#)[FDM 11-45-1, FDM 11-45-2](#)

AASHTO Roadside Design Guide

MwRSF Report TRP-03-139-04

MwRSF Report TRP-03-185-10

MwRSF Report TRP-03-191-08

MwRSF Report TRP-03-234-10

MwRSF Report TRP-03-241-10

MwRSF Report TRP-03-237-10

MwRSF Report TRP-03-165-07

MwRSF Report TRP-03-119-03

TTI Report 0-4162-2

FHWA Memo W-Beam Guardrail Installations in Rock and in Mowing Strips March 10, 2004

FHWA Memo Roadside Design: Steel Strong Post W-beam Guardrail May 17, 2010

**Bid items associated with this drawing:**

<u>ITEM NUMBER</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
614.0010	Barrier System Grading Shaping Finishing .....	EACH
614.0400	Adjusting Steel Plate Beam Guard .....	LF
614.0920	Salvaged Rail.....	LF
614.0925	Salvaged Guardrail End Treatments .....	EACH
614.0930 – 0939	Salvaged (component).....	EACH
614.0950	Replacing Guardrail Posts and Blocks .....	EACH
614.0951	Replacing Guardrail Rail and Hardware .....	LF
614.1000	MGS Guardrail Temporary .....	LF
614.1100	MGS Guardrail Temporary Thrie Beam Transition.....	LF
614.1200	MGS Guardrail Temporary Terminal EAT .....	EACH
614.2300	MGS Guardrail 3.....	LF
614.2310	MGS Guardrail 3 HS.....	LF
614.2320	MGS Guardrail 3 QS.....	LF
614.2330	MGS Guardrail 3 K.....	LF
614.2340	MGS Guardrail 3 L.....	LF
614.2500	MGS Thrie Beam Transition .....	LF
614.2610	MGS Guardrail Terminal EAT .....	EACH
614.2620	MGS Guardrail Terminal Type 2.....	EACH

**Standardized Special Provisions associated with this drawing:**

<u>STSP NUMBER</u>	<u>TITLE</u>
NONE	

**Other SDDs associated with this drawing:**

<a href="#">SDD 8d1</a>	Concrete Curb, Concrete Curb & Gutter and Ties
<a href="#">SDD 14b28</a>	Guardrail Mow Strip
<a href="#">SDD 14b43</a>	Midwest Guardrail System Long Span (MGS L)
<a href="#">SDD 14b44</a>	Midwest Guardrail System Terminal (MGS)
<a href="#">SDD 14b45</a>	Midwest Guardrail System (MGS) Thrie Beam Transition
<a href="#">SDD 14b47</a>	Midwest Guardrail System (MGS) Type 2 Terminal

**Design Notes:**

Midwest guardrail system (MGS) is a semi-rigid barrier system. MGS is NCHRP 350 or MASH test level 3 compliant. All projects with August 2011 PSE or later are to use MGS details for new beam guard installations. Individual construction detail drawings may be required (See [FDM 11-45-2.5.2](#)).

Provide working width for MGS. Working width for MGS is measured from traffic face of rail to front of hazard. If working width is not provided MGS may not perform as intended. Document in Design Study Report (DSR) when working width cannot be provided. See table below for working width for various types of MGS installations

<b>MGS Description</b>	<b>Working Width (Inches)</b>
Standard Post Spacing	59
Standard Post Spacing and Curb	66
Half Post Spacing (HS)	52
Quarter Post Spacing (QS)	46
MGS for reduced grading (MGS K)	66
Standard Post Spacing with rail flare of 5:1*	107
Standard Post Spacing with rail flare of 7:1*	97
Standard Post Spacing with rail flare of 13:1*	80

\* Flared installation requires additional design (See [FDM 11-45-2.3.1.3](#)).

Indicate in plan where different types of MGS (e.g. HS, QS, K, L...) are to be installed. If the distance from the back of post to the shoulder hinge point is less than 2-feet, install longer post at half post spacing (MGS K).

MGS may be installed with 6-inch vertical curb at high speeds (see front side of SDD). If the following conditions are present MGS may be set back further at lower speeds:

- Design or operating speeds are 45 mph or less
- Front face of rail is between 4 feet to 12 feet behind the front face of curb.
- Grading between MGS and front face of curb is 10:1 or flatter.
- Top of rail is 31 to 32 inches above the top of curb and is between 31 and 34 inches above the ground directly below the rail.

Semi-rigid barrier systems use post rotation to absorb impact energy. Pinning the post into position (e.g. encasing within asphalt or concrete, placing rip rap next to the posts...) will make it more likely that the barrier system will not function as intended. Mow strips or concrete curb and gutter can be used to control erosion and other maintenance concerns near MGS.

It is not required to install mow strips or curb and gutter near MGS. Discuss with regional or local maintenance staff the need for mow strips or curb and gutter.

Placement of objects that limit post rotation requires approval by BPD. Limited project by project exceptions for placing objects that may limit post rotation may be granted by BPD. However, these exceptions will be rare. Document the exception in DSR.

There is no short radius option for MGS. Install non-MGS beam guard ([SDD 14b15](#)) for the whole run of beam guard and use the short radius ([SDD 14b27](#)) instead of using MGS system.

Review MGS installations that span over underground obstructions, drainage structures, and box culverts. Post embedment, post location and grading near post are critical design features. Front side of SDD provides guidance on using additional blocks or spanning small underground obstructions. If this SDD will not fit given location, [SDD 14b43](#) may be used. Backside of [SDD 14b43](#) has some additional guidance on having MGS span over an underground obstruction, drainage structure, or box culvert.

MGS may use the grading and shaping bid item.

If total pavement structure is less than 2 feet (measured at edge of lane) and shallow rock is present (i.e. less than 22 inches of overburden measure from top of shoulder at post location to top of rock) contact BPD.

MGS beam guard may use the same replacement items as indicated in [FDM 11-45-2.5.2](#). MGS may be salvaged as indicated in [FDM 11-45-2.2.5.2](#).

#### **Contact Person:**

Erik Emerson (608) 266-2842